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ABSTRACT

In October, 1989, the General Accounting Office sponsored a symposium, "Meeting the Government's Technology Challenge," that brought together leaders from industry and government to explore ways of better using information technology to meet the demands facing the government into the next century. Building on the symposium's results to provide a framework for acquiring and managing information technology, this report presents five principles for effective management of information technology that emerged from the symposium: (1) commitment and vision begin at the top of an organization; (2) partnerships between organizations as well as partnerships within program offices and groups within an organization can help define goals; (3) service to the public should be the primary goal of information technology use; (4) a clear, flexible structure should support this primary goal; and (5) continuity of highly qualified technical staff is critical to successfully building information systems. The challenge of meeting this goal will require that federal leaders empower information management officials, encourage the formation of partnerships, provide a clear direction to the Congress, adopt a modular approach to developing major information systems, explore ways of professionalizing the field of information resources management, and foster continuity through the use of long-term plans. Biographies of industry and congressional speakers, a list of symposium panelists, and a list of major contributors to this report are appended. (DB)

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Meeting the Government's Technology Challenge

Results of A GAO Symposium

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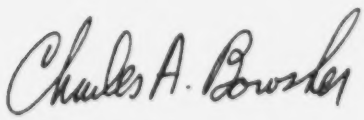
Preface

Managing the federal government's information technology is a monumental task. Over 53,000 government computer and telecommunications systems touch the lives of Americans each day. As we stand on the brink of a new decade, the government is facing the enormous challenge of modernizing many of these vital systems to ensure that the public receives the services they expect and deserve. Although the federal government is spending about $20 billion annually for this purpose, progress has been painfully slow.

We cannot afford this lack of progress. With forecasts of tighter budgets and a shrinking labor force, the government will soon have to meet the needs of the American taxpayer with less funding and fewer trained employees. Government leaders must increasingly rely upon information technology to streamline operations, improve service to the public, and handle the accelerating rate of change that will undoubtedly face government in the 1990s.

On October 4 and 5, 1989, GAO sponsored a symposium, "Meeting the Government's Technology Challenge," that brought together leaders from industry and government to explore ways of better using information technology to meet the demands facing the government into the next century. This report builds on the symposium's results to provide a framework for acquiring and managing information technology. We believe this framework offers an appropriate starting point for addressing the technology challenge facing the government now and in the future.



Charles A. Bowsher
Comptroller General
of the United States

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Abbreviations

ADP	Automatic Data Processing, Inc.
IMTEC	Information Management and Technology Division
GAO	General Accounting Office
USAA	United Services Automobile Association

Meeting the Government's Technology Challenge

Information technology systems are the lifeblood of the federal government, sustaining vital functions such as tax collection, aid to our elderly and disadvantaged citizens, and national defense. Yet it is becoming increasingly clear that many of these systems are approaching a state of crisis. Some of the most critical ones, such as those used by the Internal Revenue Service to process taxes, were designed almost 30 years ago and rely on antiquated equipment and outdated designs. Given the likelihood of continuing population increases, the demand for government services may outstrip the processing capability of many of today's systems before the end of this century.

Attempts to modernize the government's information systems have produced few successes and many costly failures. Over the past several years GAO has found skyrocketing costs, long delays, and elusive benefits to be characteristic of far too many information technology projects. The causes most often cited for this bleak history are a lack of effective leadership by senior managers, ineffective communication among those involved in developing information systems, incomplete knowledge of the customer's needs, the absence of a clear and complete systems plan or architecture, and frequent turnover among project managers and other key personnel. This record of failure has resulted in a lack of public confidence regarding the government's ability to manage information systems projects. In light of the current budget deficit and the growing demand for government services, federal managers must find a way to break this cycle of failure and begin creating a workable strategy for meeting the demands of the future.

The GAO Symposium: Focusing on the Technology Challenge

Modernizing the federal government's information technology is an enormous and complex undertaking. Given the government's disappointing record in this area, a consensus has been building among federal leaders that new ways of addressing this challenge must be explored. In October 1989 GAO convened a symposium, "Meeting the Government's Technology Challenge," to foster new ideas and fresh approaches to developing and managing the government's information technology systems. By bringing together leaders from industry, the Congress, and the executive agencies, we sought to begin a dialogue involving the major parties involved in helping the federal government use technology to meet the nation's needs. Dr. Peter Keen, Executive Director of the International Center for Information Technologies, moderated the symposium.

During the 2-day event, participants explored information technology issues and debated ways to ensure that the government will receive the greatest benefit for its information technology investments. To begin the symposium, speakers from private industry who had been highly successful in developing information technology systems recounted their experiences. Their presentations were particularly pertinent because the challenges facing these organizations were similar to those confronting the government; each was involved in delivering services to the public that required processing large amounts of data in short amounts of time. The speakers and the organizations they represent were General Donald Lasher (ret.), President for Information Systems, United Services Automobile Association (USAA); John Fisher, Senior Vice President, Banc One Corporation; Jim Grant, Executive Vice President for Systems and Technology, The Royal Bank of Canada; and Barry Kotar, President and Chief Executive Officer, Covia Corporation. Appendix I contains additional information on these speakers.

Following the industry speakers, panels composed of representatives from federal agencies, congressional committees, private industry, and academia discussed alternatives for addressing the federal government's dilemma. The ideas generated in the panels were then debated during a plenary session. Appendix II contains a listing of the panelists. Senator Frank Lautenberg of New Jersey and Representative Edward Markey of Massachusetts offered congressional perspectives on the information technology challenge. Additional information on these speakers is provided in appendix III.

Symposium Results: Principles for Managing Information Technology

Five principles for effective management of information technology emerged during the symposium. Together they provide a framework for successfully integrating information technology into the business of government. GAO's experiences over the years in reviewing the government's use of this technology has confirmed the validity of these principles. GAO suggests that agency heads examine their use of information technology and apply the following principles when developing and managing their technology plans.

Principle 1: Commitment and Vision Begin at the Top

Most successful automation efforts begin with a top manager who has a clear vision of how the organization can benefit from information technology and a commitment to making this vision a reality. Without clear direction and support from the top, modernization programs tend to

degenerate into loose collections of independent systems. Often these systems are developed under the oversight of technical managers who focus on the needs of their individual units rather than the organization's larger mission and goals. The net result is that the systems that are developed do not effectively meet the organization's or the public's needs.

The importance of visionary leadership was clearly illustrated by John Fisher of Banc One in describing the financial services industry. During the last decade—when many banks were losing ground to their competitors—bank managers were repeatedly criticized as lacking vision. An important aspect of this lack of vision was the bank managers' reluctance to embrace the promise of technology. He noted that this situation has recently changed, with many banks viewing technology as a strategic tool enabling them to stay ahead of the competition. Mr. Fisher suggested that the federal government's need for visionary leadership was analogous to the banking environment during the last decade.

Senior managers should examine their missions and begin to look forward—beyond the next budget cycle—to find the best way of serving the needs of the public in the future. Instead of simply automating existing processes and procedures, leaders need to take a fresh look at alternative ways of accomplishing their goals and embody this new thinking into a vision that can guide systems development over the long term. According to General Lasher of USAA, if information systems are developed in concert with a clear long-range vision, they become the organization's "strategic weapon" for effectively accomplishing its goals.

Leaders need to take a fresh look at alternative ways of accomplishing their goals, instead of simply automating existing processes and procedures.

After examining their mission in light of the public's future needs, agency leaders should prepare clear, forward-looking statements articulating the vision. Such a statement should describe what services the agency is to provide now and in the future and present critical milestones for implementing the vision. Specific technology plans should then be developed that will transform this vision into reality.

The agency's senior official for information resources management should play a leading role in these activities. Specifically, this official should assist in defining the vision and preparing the agency's technology plan, and then ensure that the ongoing and proposed systems development projects fall logically within this plan. The symposium participants reached a consensus that agencies need to redefine the role of the senior information resources management official and elevate the

authority of this position to ensure that these responsibilities are fulfilled.

Principle 2: Partnerships Can Help Define the Vision

Having access to the best available knowledge and advice from government, industry, and academia is critical when establishing the vision and the supporting architecture.

Forging alliances and cultivating partnerships is an essential part of defining and implementing an agency's strategic vision. Having access to the best available knowledge and advice from government, industry, and academia is critical when establishing the vision and the supporting architecture. Advisory panels, private consulting firms, research foundations, and other government agencies can provide fresh, independent perspectives and new insights. Alliances with external organizations such as these were cited by symposium participants as being invaluable.

Within an organization, partnerships between program offices and technical groups, at all levels, can promote effective communication and cooperative working relationships. Agencies should establish such partnerships as a means of ending the artificial and damaging split between technical planning and program implementation. Jim Grant of The Royal Bank of Canada noted that allowing both groups—technical and program—to actively participate on architectural planning committees almost guarantees that concerns, ideas, and solutions from both sides will be aired and addressed.

General Lasher echoed this approach for establishing organizational partnerships. USAA has created an "executive partnership" among senior managers from both program units and systems groups that promotes a cooperative environment. Representing top management, USAA's Architecture Review Board regularly convenes to ensure that stated policies and information technology projects conform to the organization's vision for the future. The consensus among the symposium participants was that agency officials should establish similar boards to ensure that the guiding vision is realized.

Agency leaders should also involve the Congress as an active partner in defining and implementing their vision. Top management must clearly articulate to the Congress how the vision will help achieve the agency's mission and describe how each major information technology project will contribute to realizing the vision. It is particularly important that the information provided to decisionmakers is as complete and realistic as possible. Further, agency management needs to evaluate and discuss with the Congress the impact its vision will have on the organizational structure and congressional constituencies. Technological change often

entails organizational change; agencies should have a plan for managing both and should communicate these plans to the Congress. With a clearer understanding of the agency's vision and goals, the Congress will be in a better position to make informed oversight decisions and assist in resolving difficult issues. Both Senator Frank Lautenberg and Representative Edward Markey highlighted the importance of working together to resolve the technology challenges facing the government.

Principle 3: Service to the Public Should Be the Vision's Cornerstone

Successful use of information technology requires understanding the needs of the customer and letting those needs dictate how technology is used. Government typically focuses its attention on internal operational needs, with little regard to an important aspect of its mission—meeting the needs and desires of the American public. Planning for information technology without considering the needs of the public can backfire, resulting in underutilized systems, increased costs, and dissatisfied customers.

During the symposium, industry leaders repeatedly emphasized that their organizations' strategies were driven to a large extent by the needs of their customers. According to Barry Kotar, Covia Corporation's technology plan is based on a comprehensive assessment and understanding of the customer's priorities and needs. In many federal agencies, the services they provide are limited by what their systems can handle, not what the taxpayer wants. Successful leaders must be in a position to anticipate how their technology systems can accommodate changes in taxpayer requirements. Echoing this point, Jim Grant observed that forming a virtual partnership with the customer is essential for developing a service-oriented system.

Agencies should actively seek to identify and understand the taxpayers' needs, both now and in the future, and not rely on the perceived demands of the past.

Senior executives should make a concerted effort to understand and incorporate the needs of the American public in developing information technology strategies. They must actively seek to identify and understand the taxpayers' needs, both now and in the future, and not rely on the perceived demands of the past. Specific vehicles for obtaining this information could include customer surveys and pilot testing. Evidence that agencies are listening to taxpayers' views will encourage a sense of confidence that scarce tax dollars are being used appropriately.

Principle 4: A Clear, Flexible Architecture Should Support the Vision

Information systems are one of the most important tools for effectively accomplishing the organization's mission. For maximum efficiency and effectiveness, these systems should be developed as part of an overall architecture or plan. An architecture is a blueprint explaining the structure of and communications among an organization's information technology resources—hardware, software, and people. It is the foundation upon which an agency builds, modifies, and expands its organizational operations.

A comprehensive plan or architecture should drive all major technology purchases.

The architecture should drive all major technology purchases. Rather than simply buying information technology without a clear plan for how it will fit into the agency's overall strategy, leaders need a comprehensive plan that will dictate the equipment and resources required. This should reduce the likelihood of acquiring inappropriate or duplicate technology and ensure that the technology can be integrated with existing systems. Developing a collection of independent information systems with no underlying foundation or architecture is unacceptable.

A clear, well-conceived architecture also offers the possibility of building an integrated information system one piece at a time, thereby minimizing the risks inherent in an all-or-nothing strategy. Constructing a system incrementally provides flexibility to modify or expand the system in response to changes in customer needs, legislative requirements, or technological advances. Barry Kotar, for example, built Covia's system incrementally using proven building blocks, thereby reducing the project's risks. This modular approach also enables the customer to begin reaping the benefits of the system sooner. The symposium participants agreed that it was preferable to avoid very large, monolithic projects in favor of developing smaller, modular components within the architecture.

Principle 5: Management Continuity Is Needed to Implement the Vision

Continuity at the project management level is essential to realizing the vision. In the past, government has had difficulty maintaining the continuity necessary to provide consistent direction and clear accountability for information systems development efforts. All too often, changes in management occur that significantly affect the direction of an information systems project, thereby increasing costs, delaying the delivery

of the project's benefits, and clouding accountability for the project's success.

Continuity of highly qualified technical staff is critical to successfully building information systems.

Assembling and retaining a team of highly qualified officials to manage critical information systems projects is essential to implementing the vision. Jim Grant stressed that the quality of the people supporting the leaders in the organization will determine whether the vision can be carried out. Operating on this philosophy, The Royal Bank of Canada established an intensive university recruiting program to ensure that highly skilled students are being hired. In this vein, symposium participants agreed that a move toward professionalizing the field of information resources management would enhance the quality of project managers. Suggestions offered included establishing a governmentwide training curriculum and developing a federal project management methodology.

Since retaining key, highly qualified officials to maintain continuity within technology projects is a major dilemma, agencies should explore new ways of bringing continuity to the process of managing these projects. For example, developing a detailed long-term strategy that can transcend personnel changes would mitigate some of the risks associated with management turnover. Using advisory committees and individual consultants to provide consistent institutional memory and perspective would also help achieve continuity.

The Challenge for the Future

As we move toward the next century, information technology promises to provide higher quality government services at reduced cost to the public. The challenge of making this promise a reality rests primarily with our leaders, who must provide the commitment and vision necessary to change the way government operates in this critical arena. Specifically, GAO believes that for this endeavor to be successful, federal leaders will need to

- charge the senior information resources management official in each agency with defining and implementing a clear yet flexible architecture that embodies the agency's vision of how it will do business in the future;
- encourage the formation of internal and external partnerships through organizations such as architecture planning committees, review boards, or advisory committees;
- clearly explain the agency's overall vision and direction in providing information to the Congress;

- ground all technology decisions in a thorough understanding of the needs of the public;
- adopt a modular approach to developing major systems and consider capping the size of project phases where implementation risks are high;
- explore ways of professionalizing the field of information resources management, such as establishing a governmentwide training curriculum and developing a federal project management methodology; and
- foster continuity through the use of detailed long-term plans, advisory committees, and individual consultants.

These steps constitute a promising agenda for action, but they are only a beginning. The dialogue begun during the symposium must be continued, new insights must be shared, and new solutions must be found if the government is to meet its technology challenge.

The time to act is now. The information technology crisis the government is facing will not resolve itself; it requires immediate action and continuing attention. Committed, visionary leadership is needed to address this crisis. Agency heads should demonstrate this leadership by applying the framework to their strategies for acquiring and managing information technology.

Biographies of Industry Speakers

John F. Fisher
Banc One Corporation

John Fisher is Senior Vice President for Banc One Corporation. Known today as an innovator in electronic consumer banking, Banc One enjoys great success: it is the third most profitable bank in Ohio's five-state area and boasts over $36 billion in assets.

Mr. Fisher's first major banking innovation was the bank credit card. In 1966, Banc One joined with Bank of America, which enabled Banc One to market the credit card nationally. The BankAmericard, later renamed Visa, was the first nationally accepted credit card and established Banc One as a banking leader. Under Mr. Fisher, Banc One also produced the first on-line credit-card authorization service and the first form of overdraft protection, linking credit cards together with checking accounts. Mr. Fisher has set a precedent in the industry by demonstrating the close relationship between technology and banking in meeting the needs of the customer.

J.C. (Jim) Grant
The Royal Bank of Canada

Jim Grant is the Executive Vice President for Systems and Technology at The Royal Bank of Canada. The Royal Bank is Canada's largest, with assets exceeding U.S.$90 billion and having 1,500 domestic branches plus 240 international offices.

Headquartered in Montreal and Toronto, the Royal Bank has been a leader in the application of new technologies for efficient operational management and for providing a variety of sophisticated services. Under Mr. Grant's leadership, the Royal Bank has expanded its electronic network for both personal and commercial banking.

Barry A. Kotar
Covia Corporation

Barry Kotar is President and Chief Executive Officer of Covia Corporation, a position he has held since the company was formed in January 1987 as an operating subsidiary of United Airlines. In August 1988, United sold half of Covia to five other air carriers, forming a partnership with USAir, British Airways, KLM Royal Dutch Airlines, Swissair, and Alitalia.

Covia is the leading worldwide travel distribution company. Under Mr. Kotar's leadership, the company develops and markets advanced automation products, information systems, and network services, including the world's most advanced computer reservation system. Mr. Kotar's philosophy stresses developing systems that will support corporate growth and expansion in the future.

Gen. Donald R. Lasher United Services Automobile Association

Donald Lasher is President of Information Services for United Services Automobile Association, an insurance and financial services company noted as a technological leader. General Lasher provides the automated systems, communications, and computer support for all USAA activities. Directing a 1,500-person systems and telecommunications staff, he oversees an operation whose budget exceeds $125 million annually and includes the world's largest automatic telephone call distribution system under one roof.

At USAA, General Lasher spearheaded development of an automated, multifunctional workstation environment with on-line, real-time support to over 11,500 users worldwide. He also directed the development of a highly successful image-processing system that captures and stores all of USAA's incoming property and casualty policy service mail.

Appendix II

Symposium Panelists

Dr. Maryam Alavi, Associate Professor of Information Systems, University of Maryland

Jack L. Brock, Director, Government Information and Financial Management, U.S. General Accounting Office

Herbert R. Doggette, Jr., Deputy Commissioner for Operations, Social Security Administration

John R. Dyer, Deputy Commissioner for Management, Social Security Administration

Robert Gellman, Staff Member, Subcommittee on Government Information, Justice and Agriculture, House Committee on Government Operations

Edward J. Gleiman, Staff Director, Subcommittee on Federal Services, Post Office and Civil Service, Senate Committee on Governmental Affairs

Theodore F. Gonter, Director, Systems Engineering and Integration, Internal Revenue Service

Steven Katz, Chief Counsel, Subcommittee on Government Information and Regulation, Senate Committee on Governmental Affairs

Francis A. McDonough, Deputy Commissioner for Federal Information Resources Management, General Services Administration

Peter C.S. Nicoll, Manager, Business Management Program, The Royal Bank of Canada

Henry H. Philcox, Acting Assistant Commissioner, Computer Services, Internal Revenue Service

Fred L. Sims, Assistant Commissioner, Information Resources Management Policy, General Services Administration

Dr. Rona B. Stillman, Chief Scientist, U.S. General Accounting Office

Lynda Woodman, President, International Center for Information Technologies

Biographies of Congressional Speakers

Sen. Frank R. Lautenberg State of New Jersey

Frank Lautenberg represents the state of New Jersey in the United States Senate. Since 1985 he has been a member of the Senate Appropriations Committee, with key roles on various subcommittees. In 1987 Senator Lautenberg began chairing the Committee's Subcommittee on Transportation.

After graduating in 1949 from Columbia University with a degree in economics, Senator Lautenberg began selling payroll services for a small business in New Jersey. Aided by computer technology, this business evolved into Automatic Data Processing (ADP), Inc., marking the beginning of the American computing services industry.

Over the past 30 years, ADP, Inc., has become a worldwide leader in the computing industry. Senator Lautenberg served as Chief Executive Officer and Chairman of the Board until elected to the Senate in 1982. Today, ADP is the largest computing services firm in the world, with annual revenues of more than $1 billion and more than 22,000 employees.

Rep. Edward J. Markey Seventh District of Massachusetts

A graduate of Boston College School of Law, Edward Markey was elected to the Congress in 1976 from the seventh district of Massachusetts. Since his election to the Congress, he has risen steadily in the ranks of its committee structure.

In 1987 Representative Markey took over the chairmanship of the Telecommunications and Finance Subcommittee of the Energy and Commerce Committee, a post that holds particular interest for him because of Boston's growing financial sector and Massachusetts' role as a leader in the high-technology community. As subcommittee chairman, he presides over interstate and foreign telecommunications, including all telecommunications and information transmission. Representative Markey's recent efforts involve overhauling the regulation of securities laws to prevent a recurrence of the stock market crash of 1987.

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